



East River

Watershed Summary

WATERSHED DESCRIPTION AND MAPS

The East River watershed covers an area of approximately 12,830 acres in the southern coastal area of Connecticut (Figure 1). There are several towns located at least partially in the watershed, including the municipalities of Guilford and Madison, CT.

The East River watershed includes one segment impaired for recreation due to elevated bacteria levels (CT5108-00_01). This segment was assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. An excerpt of the Integrated Water Quality Report is included in Table 1 (CT DEEP, 2010).

The East River begins in a large forested area in eastern Guilford and western Madison. The bacteria impaired segment (CT5108-00_01) begins where an unnamed tributary enters the East River near White Birch Drive in Guilford, flows south parallel to Sullivan Drive, passes under Sullivan Drive in Guilford, and ends just upstream of the Foot Bridge Road crossing in central Guilford (Figure 2). The segment is 0.67 miles long and located entirely within the Town of Guilford.

The impaired segment of the East River has a water quality classification of A. Designated uses include potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. This segment of the river is impaired due to elevated bacteria concentrations, affecting the designated use of recreation. As there are no designated beaches in this segment of the East River, the specific recreation impairment is for non-designated swimming and other water contact related activities.

Impaired Segment Facts

Impaired Segment:

East River (CT5108-00_01)

Municipality: Guilford

Impaired Segment Length (miles):

0.67

Water Quality Classification:

Class A

Designated Use Impairment:

Recreation

Sub-regional Basin Name and

Code: East River, 5108

Regional Basin: South Central

Eastern Complex

Major Basin: South Central Coast

Watershed Area (acres): 12,830

MS4 Applicable: Yes

Applicable Season: Recreation
Season (May 1 to September 30)

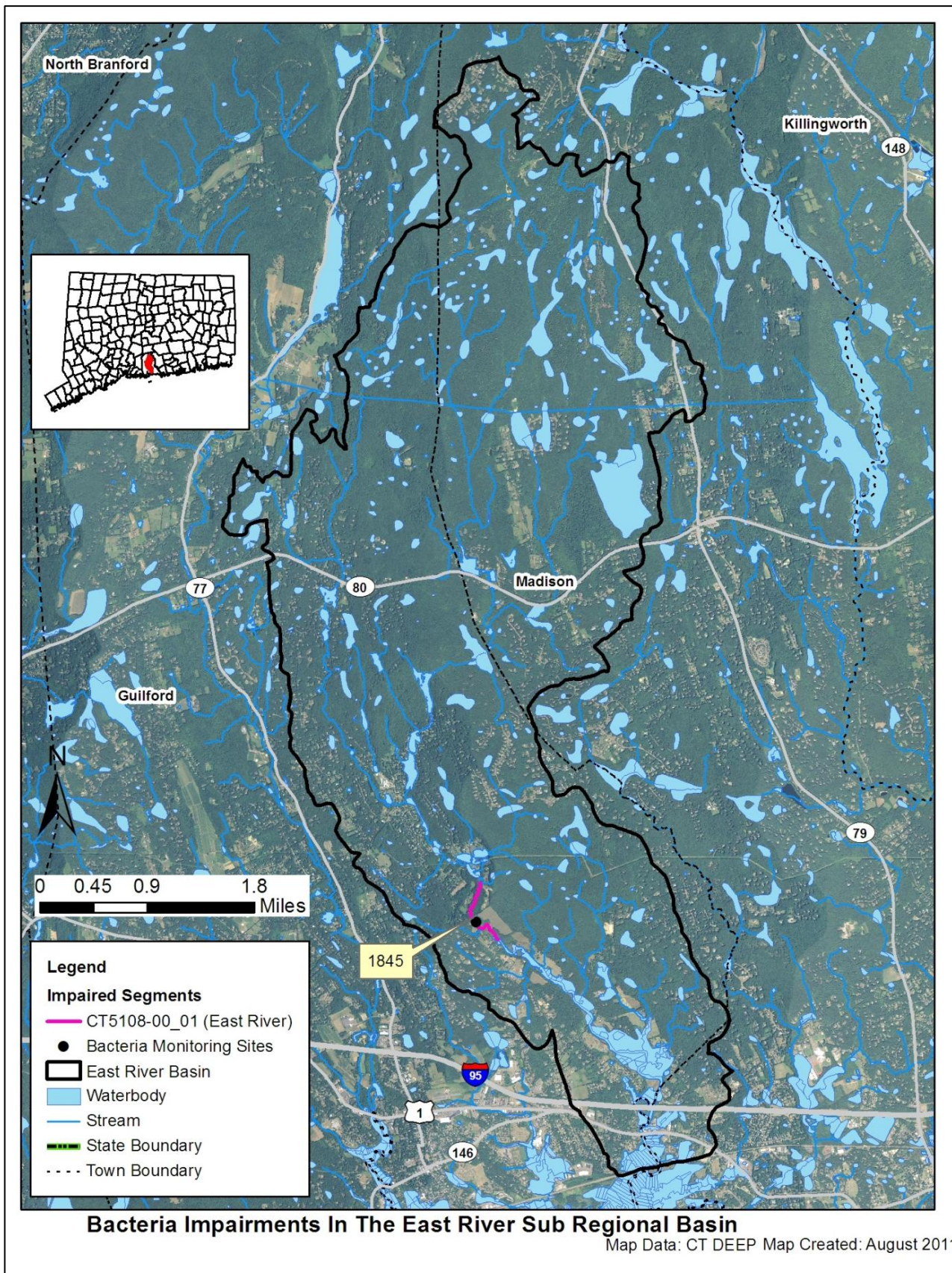
Figure 1: Watershed location in Connecticut



Table 1: Impaired segment and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report

Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT5108-00_01	East River (Guilford)-01	From Platner Dam (just US of Foot Bridge Road crossing, head of tide), US to 2nd unnamed tributary (below lakes), Guilford.	0.67	U	NOT	FULL
FULL = Designated Use Fully Supported NOT = Designated Use Not Supported U = Unassessed						

Figure 2: GIS map featuring general information of the East River watershed at the sub-regional level



Land Use

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from nutrients and bacteria from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the East River watershed consists of 17% urban area, 69% forest, 2% agriculture, and 12% water. The majority of the watershed surrounding the impaired segment is a mix of urban, forested, and agricultural land uses. There is a small, but dense residential development off Nut Plains Road near the impaired segment. There are also several large agricultural areas in the East River watershed adjacent to the impaired segment, particularly near Station 1845 in Guilford (Figure 4).

Figure 3: Land use within the East River watershed

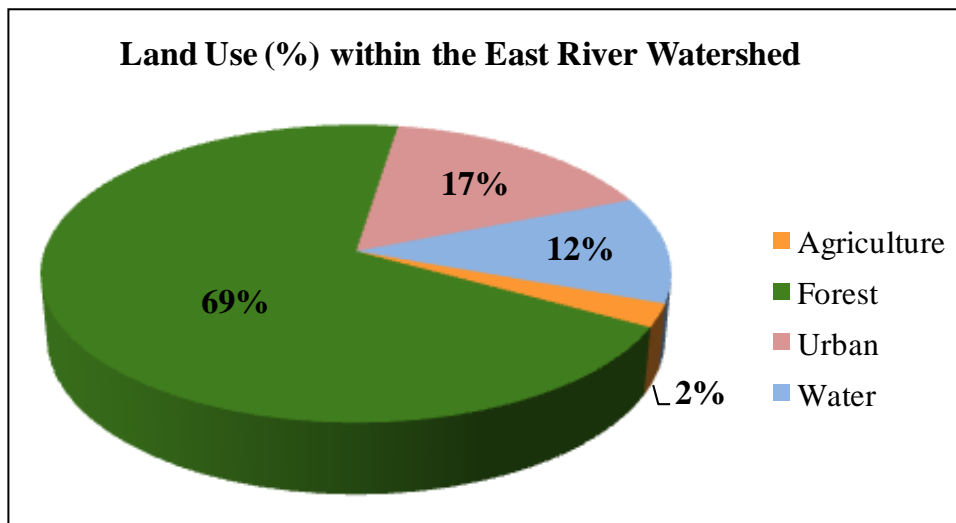
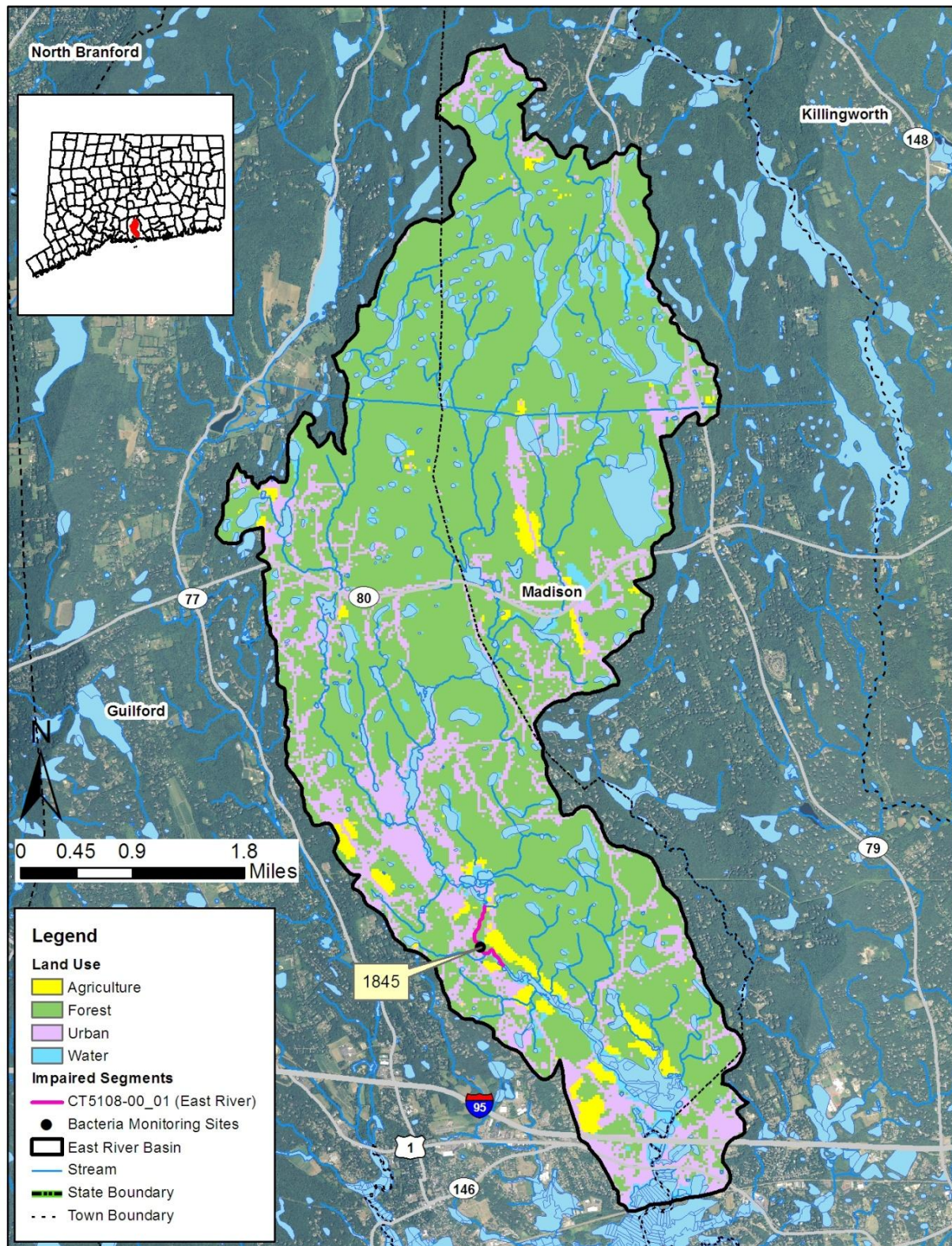


Figure 4: GIS map featuring land use for the East River watershed at the sub-regional level



Land Use In The East River Sub Regional Basin

Map Data: CT DEEP Map Created: August 2011

WHY IS A TMDL NEEDED?

E. coli is the indicator bacteria used for comparison with the CT State criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture, or volunteer monitoring efforts at stations located on the impaired segments.

Table 2: Sampling station location description for the impaired segment in the East River watershed

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT5108-00_01	East River	1845	Private drive off Goose Lane (between Sullivan Dr and Nut Plains Road)	Guilford	41.312525	-72.674825

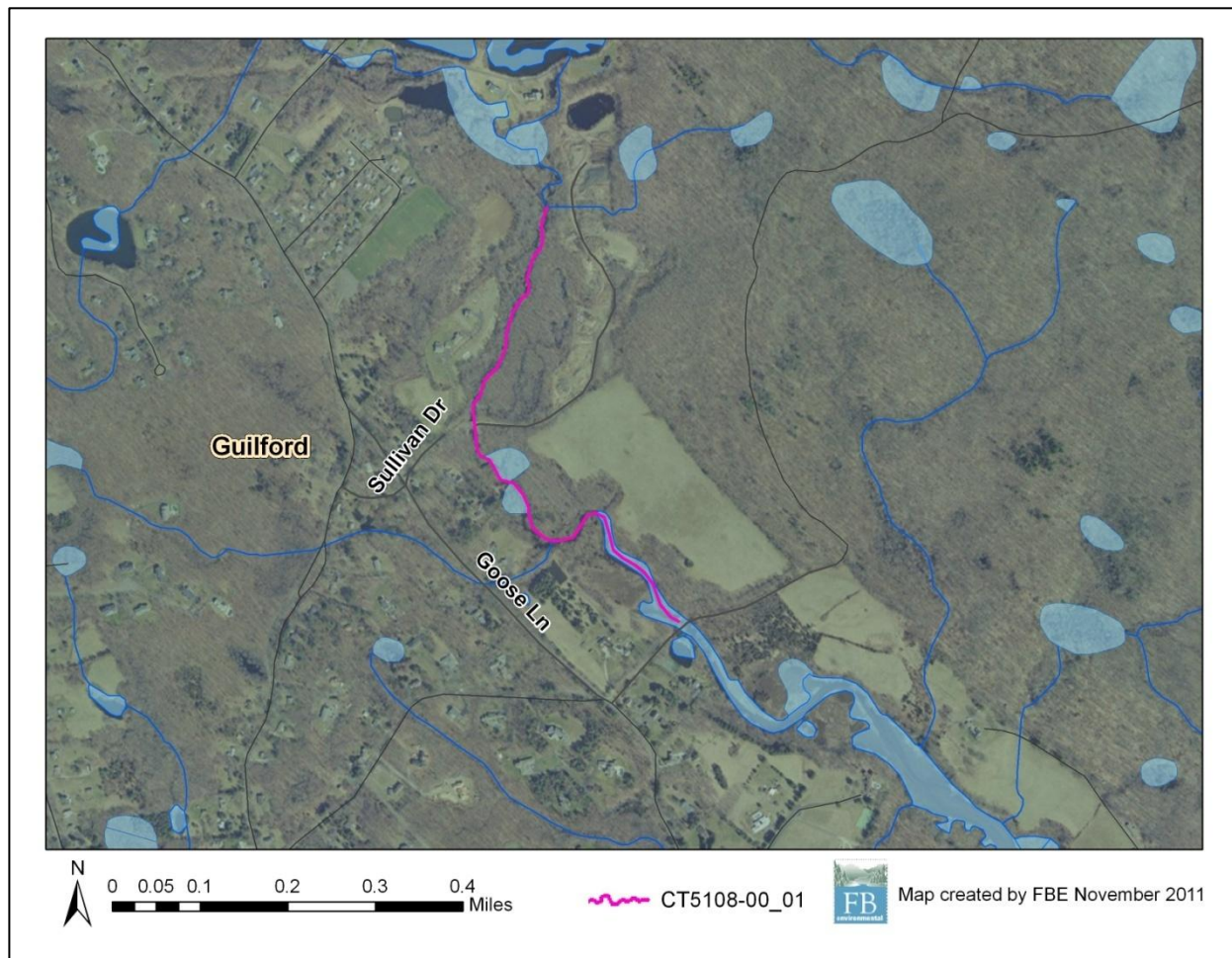
The East River (CT5108-00_01) is a Class A freshwater river (Figure 5). Its applicable designated uses are a potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location (Station 1845) from 2006-2009.

The water quality criteria for *E. coli*, along with bacteria sampling results from 2006-2009, are presented in Table 8. The annual geometric mean was calculated for Station 1845 and exceeded the WQS for *E. coli* for all sample years. Single sample values at this station also exceeded the WQS for *E. coli* on several sample dates in each year.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for Station 1845 for wet-weather and dry-weather sampling days (Table 8). For the impaired segment of the East River, the geometric mean exceeded the WQS for *E. coli* at Station 1845 during both wet and dry-weather. At Station 1845, the geometric mean during wet-weather was nearly twice dry-weather.

Due to the elevated bacteria measurements presented in Table 8, this segment of the East River did not meet CT's bacteria WQS, was identified as impaired, and was placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all water bodies to comply with state WQS.

Figure 5: Aerial map of the impaired segment of the East River

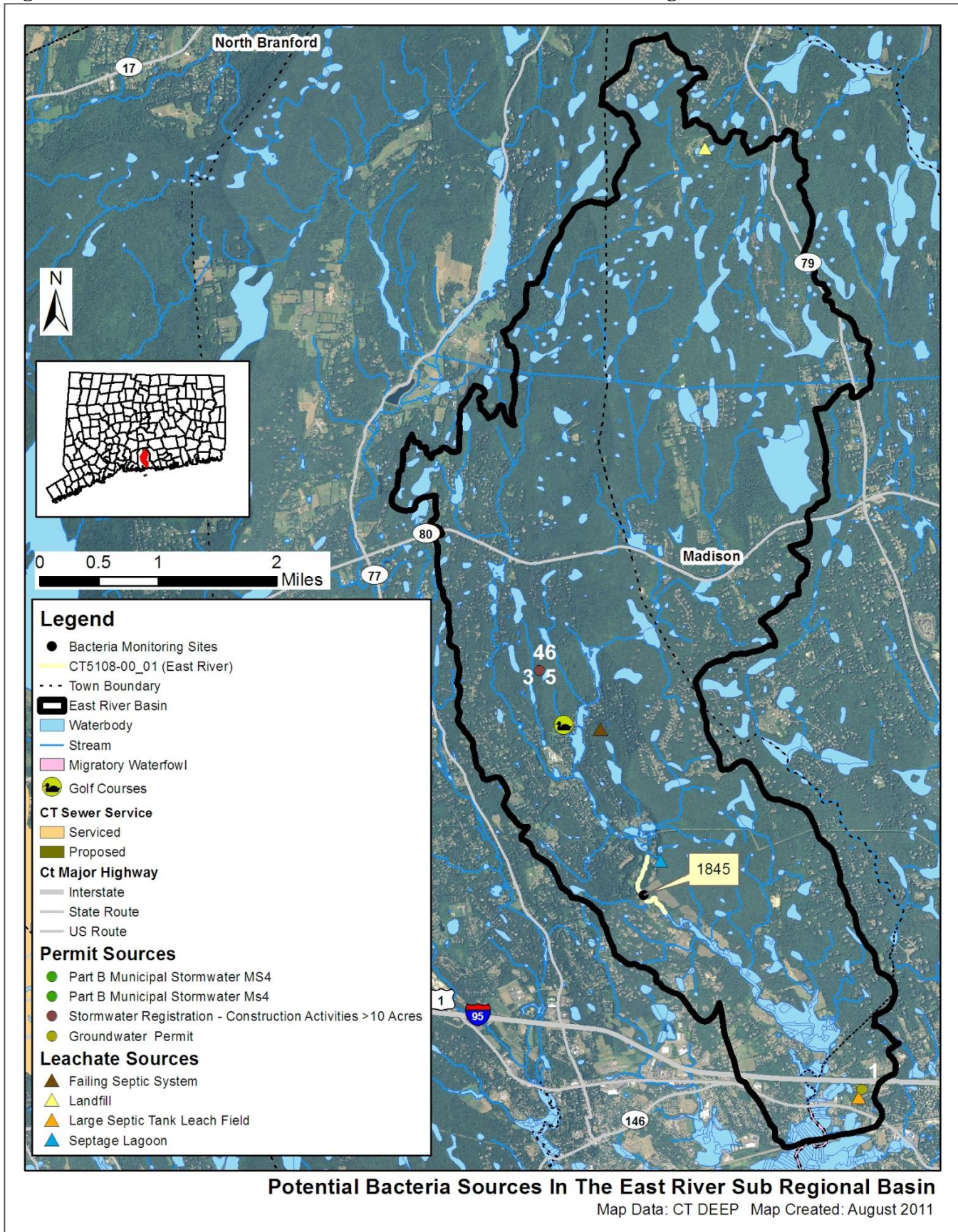


POTENTIAL BACTERIA SOURCES

Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the watershed based on land use (Figures 3 and 4) and a collection of local information for the impaired waterbody is presented in Table 3 and Figure 6. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segments. Further monitoring and investigation will confirm listed sources and discover additional ones. Some segments in this watershed are currently listed as unassessed by CT DEEP procedures. This does not suggest that there are no potential issues on this segment, but indicates a lack of current data to evaluate the segment as part of the assessment process. For some segments, there are data from permitted sources, and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

Table 3: Potential bacteria sources in the East River watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/Pets	Other
East River CT5108-00_01	x	x		x	x	x	x	x

Figure 6: Potential sources in the East River watershed at the sub-regional level

The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map, then no sources were discovered during the analysis. The following is the list of potential sources that were evaluated: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

Point Sources

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. A list of active permits in the watershed is included in Table 5. Additional investigation and monitoring could reveal the presence of additional discharges in the watershed.

Table 4: General categories list of other permitted discharges

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	0
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	0
GSI	Stormwater Associated with Industrial Activity	0
GSM	Part B Municipal Stormwater MS4	2
GSN	Stormwater Registration – Construction	1
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	3

Permitted Sources

As shown in Table 5, there are multiple permitted discharges in the East River watershed. Bacteria data from these industrial permitted facilities are not available. Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point. Sometimes this location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit.

Table 5: Permitted facilities within the East River watershed

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
Guilford	Town Of Guilford	UI0000283	Groundwater Permit	Town Of Guilford/Board Of Ed	3
Guilford	Rollwood Homeowners Association, Inc.	UI0000286	Groundwater Permit	Rollwood Homeowners Association, Inc.	4
Guilford	Town Of Guilford	GSM000077	Part B Municipal Stormwater Ms4	Guilford, Town Of	N/A(5)
Guilford	Brian Ferris Construction, Llc	GSN001673	Stormwater Registration - Construction Activities >10 Acres	Northern Heights Subdivision	6
Madison	Town of Madison	GSM000051	Part B Municipal Stormwater Ms4	Madison, Town of	N/A
Madison	Harborside Connecticut L.P., Sun Healthcare Group, Inc.	UI0000273	Groundwater Permit	Healthcare Madison House	1

Municipal Stormwater Permitted Sources

Per the EPA Phase II Stormwater rule all municipal storm sewer systems (MS4s) operators located within US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s) together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to

create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.

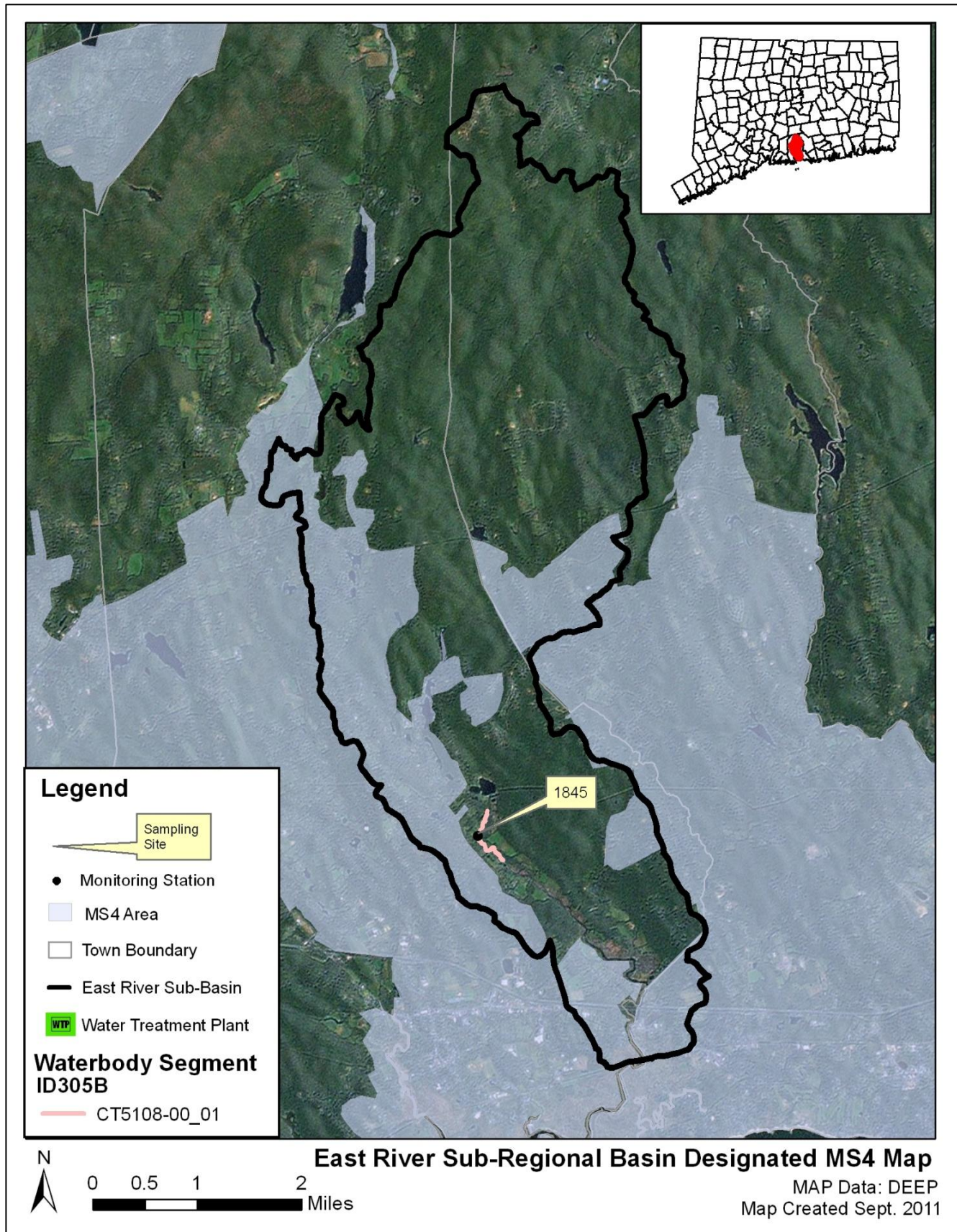
As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Woodstock. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut, the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

The impaired segment of the East River watershed is located within the Town Guilford. Guilford is a designated urban area, as defined by the U.S. Census Bureau, and are required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the Connecticut Department of Energy and Environmental Protection (DEEP) (Figure 7). This general permit is only applicable to municipalities that are identified in Appendix A of the MS4 permit that contain designated urban areas and discharge stormwater via a separate storm sewer system to surface waters of the State. The permit required municipalities to develop a Stormwater Management Plan (SMP) to reduce the discharge of pollutants as well as to protect water quality. The MS4 permit is discussed further in the “TMDL Implementation Guidance” section of the core TMDL document. Additional information regarding stormwater management and the MS4 permit can be obtained on CTDEEP’s website

(http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654).

Figure 7: MS4 areas of the East River watershed



Non-point Sources

Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the East River watershed are described below.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA, 2011a). This runoff can include pollutants from farm practices such as storing manure, allowing livestock to wade in nearby waterbodies, applying fertilizer, and reducing the width of vegetated buffer along the shoreline. Although agricultural land use makes up only 2% of the East River watershed, there are agricultural lands adjacent to the impaired segment of the East River and its tributaries, particularly along Sullivan Drive near Station 1845 and Goose Lane in Guilford. Agricultural areas near the impaired segment and its tributaries are potentially carrying pollutants, including bacteria, into the East River. A high geometric mean for bacteria during wet-weather may indicate that stormwater runoff is contributing pollutants to nearby waterbodies. Stormwater runoff includes runoff from agricultural fields. As shown in Table 8, the geometric mean for *E. coli* during wet-weather exceeded the WQS at Station 1845. This suggests that agricultural runoff is likely contributing bacteria to the East River.

Insufficient Septic Systems

As shown in Figure 6, all residents of the East River watershed rely on onsite wastewater treatment systems, such as septic systems, and a failed septic system upstream of the impaired segment near the north end of Upper Guilford Lake was identified. There may be undetected failed septic systems in the watershed. Insufficient or failing septic systems can be significant sources of bacteria by allowing raw waste to reach surface waters. In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. The Town of Guilford has its own health department (<http://www.ci.guilford.ct.us/health-department.htm>).

A high geometric mean for bacteria during dry-weather may indicate that illicit discharges or insufficient septic systems are contributing bacteria to nearby waterbodies. As shown in Table 8, the geometric mean for *E. coli* during dry-weather exceeded the WQS at Station 1845. This suggests that insufficient septic systems are likely contributing bacteria to the East River.

Stormwater Runoff from Developed Areas

While the majority of the East River watershed is forested and undeveloped, there are developed areas in close proximity to the impaired segment. Approximately 17% of the land use in the watershed is considered urban, and much of that area is concentrated around or just upstream of the impaired segment in the Town of Guilford (Figures 4 and 9). Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate into the soil. Studies have shown a link between increasing impervious cover and degrading water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover in a watershed (Mallin *et al.*, 2000).

Approximately 85% of the East River watershed is characterized by 0-6% impervious cover, 15% is 7-11% impervious cover, and <1% is 12-15% impervious cover (Figure 8). Although the area surrounding the impaired segment is characterized by 0-6% impervious cover, some development on Nut Plains Road is located near the impaired segment in Guilford, and may be contributing pollutants from stormwater runoff. The geometric mean for *E. coli* exceeded the WQS during wet-weather at Station 1845, which suggests that stormwater runoff is likely contributing bacteria to the East River.

Figure 8: Range of impervious cover (%) in the East River watershed

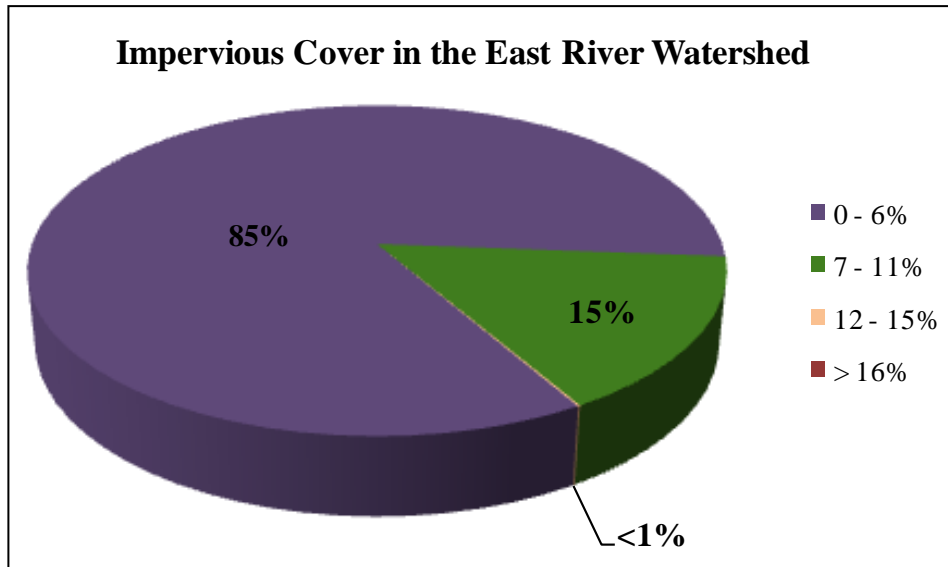
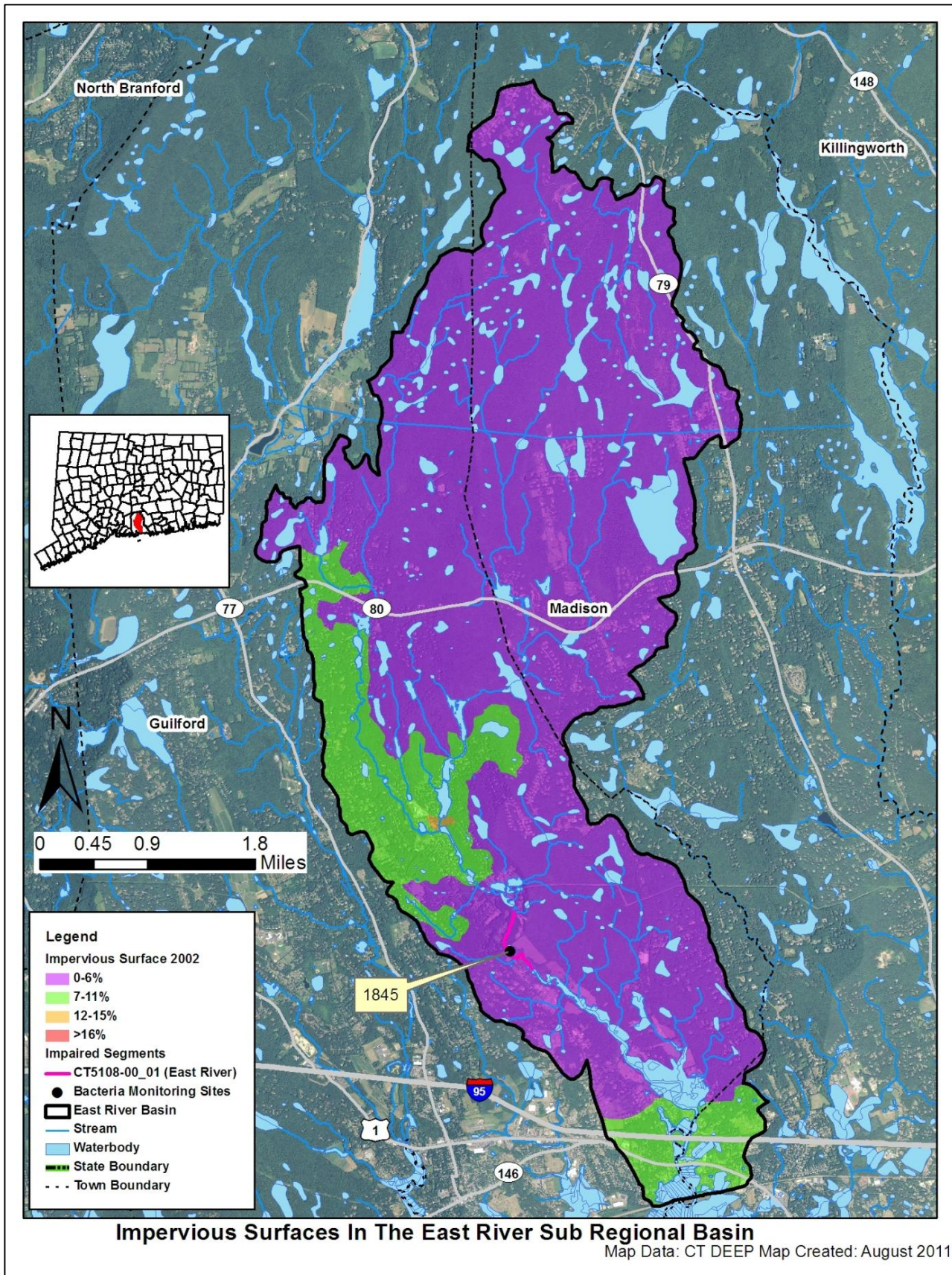


Figure 9: Impervious cover (%) for the East River sub-regional watershed

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the East River watershed represent another potential source of bacteria. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. These physical land alterations can exacerbate the impact of natural sources on water quality (USEPA, 2001).

Geese and other waterfowl are known to congregate in open areas including recreational fields, golf courses, and agricultural cropfields. There are several recreational fields in close proximity to the East River, including the Guilford Lakes School and fields on North Madison Road, Nut Plains Park on Nut Plains Road, and Guilford Lakes Country Club on Maupas Road. The East River watershed is comprised of 12% surface water. The small lakes and ponds in the watershed and along the East River can provide areas for geese and other waterfowl to congregate. In addition to creating a nuisance, large numbers of geese can also create unsanitary conditions on the grassed areas and ponds and cause water quality problems due to bacterial contamination associated with their droppings. Large populations of geese can also lead to habitat destruction as a result of overgrazing on wetland and riparian plants.

Also, urban residential development surrounds a portion of the impaired segment of the East River (Figure 5). Waste from domestic animals such as dogs, can enter surface waters directly or through stormwater infrastructure.

Additional Sources

There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in the East River. Further monitoring and investigation will confirm the listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

Land Use/Landscape

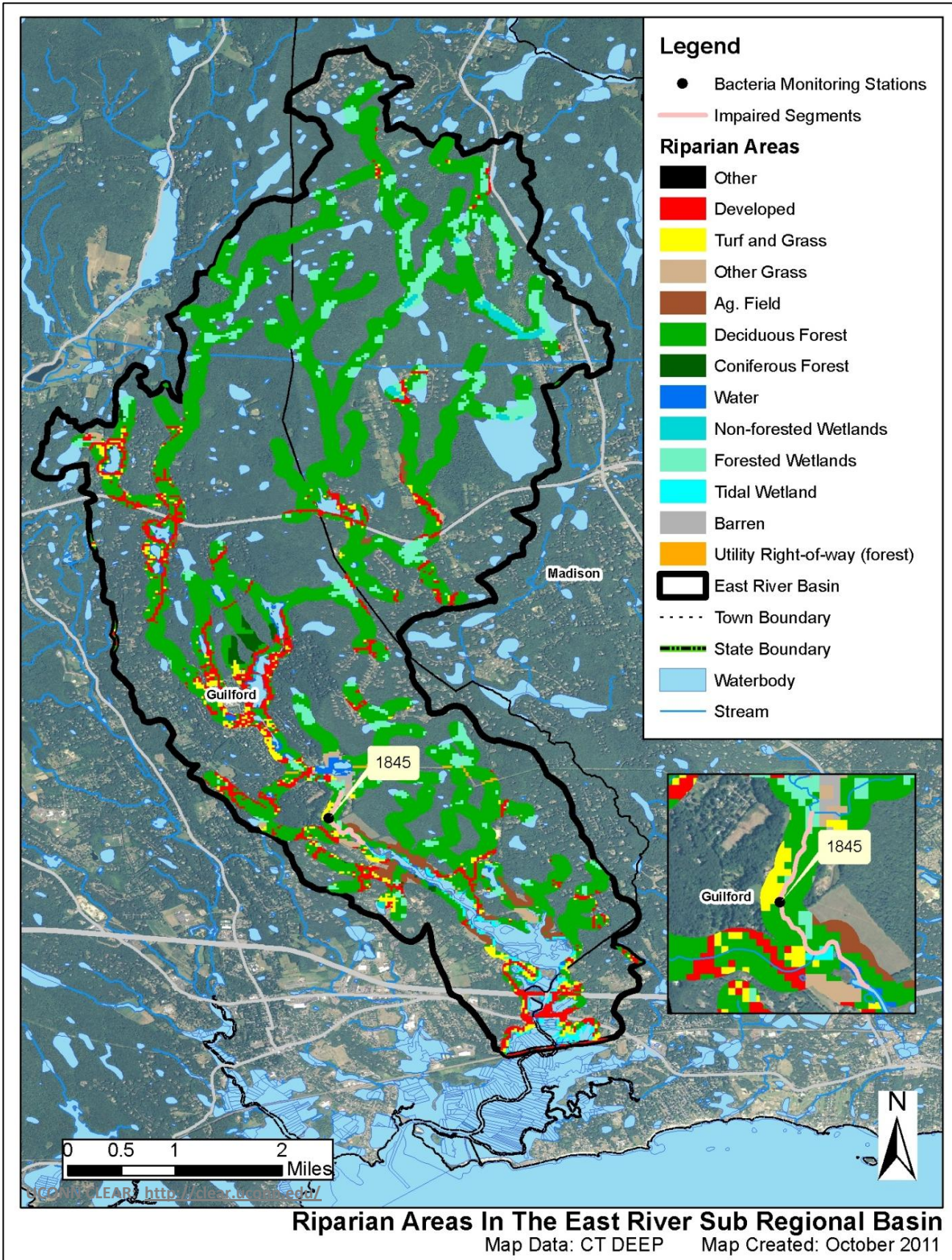
Riparian Buffer Zones

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and the adjoining uplands is gradual and not always well-defined. However, riparian zones differ from uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (<http://clear.uconn.edu/>), which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. The land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff sources.

The majority of the riparian zone for the impaired segment of the East River is characterized by developed, forested, and agricultural land uses (Figure 10). The riparian zone downstream of Station 1845 along the impaired segment includes multiple agricultural operations. As previously mentioned, developed and agricultural areas are potential sources of bacterial contamination.

Figure 10: Riparian buffer zone information for the East River watershed



CURRENT MANAGEMENT ACTIVITIES

The Towns of Guilford and Madison have developed and implemented programs to protect water quality from bacterial contamination. As indicated previously, both towns are regulated under the MS4 program. The MS4 General Permit is required for any municipality with urbanized areas that initiates, creates, originates or maintains any discharge of stormwater from a storm sewer system to waters of the State. The MS4 permit requires towns to design a Stormwater Management Plan (SMP) to reduce the discharge of pollutants in stormwater to improve water quality. The plan must address the following 6 minimum measures:

1. Public Education and Outreach.
2. Public Involvement/Participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in the new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Each municipality is also required to submit an annual update outlining the steps they are taking to meet the six minimum measures. All updates that address bacterial contamination in the watershed are summarized in Tables 6 and 7.

Table 6: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Guilford, CT (GSM000077)

Minimum Measure	Guilford 2009 Annual Report Update
Public Outreach and Education	1) The Town of Guilford Water Pollution Control made the brochure "Septic Care and Maintenance for the Homeowner" available to local residents.
Public Involvement and Participation	1) The Town conducted a clean-up day in the spring of 2009.
Illicit Discharge Detection and Elimination	1) Guilford DPW has mapped, with GPS units, all of the storm drains and outfall pipes in the Town.
	2) The Town continues to review areas of town that have a potential for illicit discharges.
	3) The Town's Health Department has helped to repair 81 septic systems and replace 26 septic systems.
Construction Site Stormwater Runoff Control	1) The Guilford Engineering Department inspects all stormwater systems installed on commercial, industrial, and residential properties.
Post Construction Stormwater management	1) The Town's Conservation Commission worked with the USDA NRCS on creating a Natural Resource Inventory for the Town of Guilford.
Pollution Prevention and Good Housekeeping	1) The Town is developing a comprehensive Pollution Prevention Plan for municipal operations such as parks and open space maintenance.

Table 7: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Madison, CT (Permit # GSM000051)

Minimum Measure	Madison 2010 Annual Report Update
Public Outreach and Education	1) The Town of Madison gives out a booklet on septic systems and stormwater with every Certificate of Occupancy issued.
Public Involvement and Participation	No updates
Illicit Discharge Detection and Elimination	1) Madison's Planning and Zoning Commission has passed interim stormwater regulations to address IDDE issues.
	2) The Town is currently mapping with GIS all stormwater outfalls in the town. As of 2010 all of the areas South of I-95 and all significant residential areas have been mapped.
Construction Site Stormwater Runoff Control	No updates
Post Construction Stormwater management	No updates
Pollution Prevention and Good Housekeeping	1) The Town sends a Stormwater Fact Sheet to all contractors, lawn maintenance and landscaping companies working within Madison annually.
	2) The town cleans all catch basins at least once every year.
	3) The town sweeps all streets annually, and sweeps the downtown area of Madison every two weeks from spring to fall.

RECOMMENDED NEXT STEPS

The Towns of Guilford and Madison have developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of the impaired segment of the East River and have been prioritized below.

1) Ensure there are sufficient buffers on agricultural lands along East River.

If not already in place, agricultural producers should work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service to develop conservation plans for their farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict livestock and horse access to streams and wetlands, and that animal waste handling, disposal, and other appropriate Best Management Practices (BMPs) are in place. Particular attention should be paid to those agricultural operations located along the impaired segment and along tributary streams of the impaired segment.

2) Develop a system to monitor septic systems.

All residents in the watershed rely on septic systems (Figure 6). Guilford DPW has mapped with GPS all storm drains and outfall pipes, has repaired and/or replaced over 100 septic systems, and continues to inspect areas for potential illicit discharges. Madison is also currently mapping with GPS all stormwater outfalls with all areas south of I-95 and significant residential area completed. Guilford and Madison should expand their programs to ensure that existing septic systems are properly operated and maintained. For instance, communities can create an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of the sub-standard systems within a reasonable timeframe could also be adopted. Madison can also develop programs to assist citizens with the replacement and repair of older and failing systems.

3) Identify areas to implement Best Management Practices (BMPs) to control stormwater runoff.

As noted previously, the Towns of Guilford and Madison are MS4 communities regulated by the MS4 program. Since 17% of the watershed is considered urban and developed areas are located near the impaired segment, stormwater runoff is likely contributing bacteria to the waterbody. To identify specific areas that are contributing bacteria to the impaired segment, the towns should conduct wet-weather sampling at stormwater outfalls that discharge directly to the East River. To treat stormwater runoff, the towns should also identify areas along the more developed sections of the East River, particularly along the impaired segment, to install BMPs designed to encourage stormwater to infiltrate into the ground before entering the East River. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. More detailed information and BMP recommendations can be found in the core TMDL document.

4) Evaluate municipal education and outreach programs regarding animal waste.

Guilford can take measures to minimize waterfowl-related impacts, such as encouraging residents and businesses to allow tall, coarse vegetation to grow in the riparian areas frequented by waterfowl, particularly within parks and golf courses. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shoreline will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in the East River watershed and can harm human health and the environment. Animal wastes should be disposed

away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-uses areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

5) Monitor permitted sources.

Currently there are no available discharge data for the permitted discharges in the East River watershed. Monitoring would provide information essential to better locate, understand, and reduce pollution sources. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility are an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection.

Section 6(k) of the MS4 General Permit requires a municipality to modify their Stormwater Management Plan to implement the TMDL within four months of TMDL approval by EPA if stormwater within the municipality contributes pollutant(s) in excess of the allocation established by the TMDL. For discharges to impaired waterbodies, the municipality must assess and modify the six minimum measures of its plan, if necessary, to meet TMDL standards. Particular focus should be placed on the following plan components: public education, illicit discharge detection and elimination, stormwater structures cleaning, and the repair, upgrade, or retrofit of storm sewer structures. The goal of these modifications is to establish a program that improves water quality consistent with TMDL requirements. Modifications to the Stormwater Management Plan in response to TMDL development should be submitted to the Stormwater Program of DEEP for review and approval.

Table 8 details the appropriate bacteria criteria for use as waste load allocations established by this TMDL for use as water quality targets by permittees as permits are renewed and updated, within the East River watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

Table 8. Bacteria (e.coli) TMDLs, WLAs, and LAs for Recreational Use

		Instantaneous <i>E. coli</i> (#/100mL)						Geometric Mean <i>E. coli</i> (#/100mL)	
Class	Bacteria Source	WLA ⁶			LA ⁶			WLA ⁶	LA ⁶
	Recreational Use	1	2	3	1	2	3	All	All
A	Non-Stormwater NPDES	0	0	0				0	
	CSOs	0	0	0				0	
	SSOs	0	0	0				0	
	Illicit sewer connection	0	0	0				0	
	Leaking sewer lines	0	0	0				0	
	Stormwater (MS4s)	235 ⁷	410 ⁷	576 ⁷				126 ⁷	
	Stormwater (non-MS4)				235 ⁷	410 ⁷	576 ⁷		126 ⁷
	Wildlife direct discharge				235 ⁷	410 ⁷	576 ⁷		126 ⁷
	Human or domestic animal direct discharge ⁵				235	410	576		126

- (1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.
- (2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.
- (3) **All Other Recreational Uses.**
- (4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)
- (5) Human direct discharge = swimmers
- (6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations
- (7) Replace numeric value with "natural levels" if only source is naturally occurring wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL**Table 9: East River Bacteria Data****Waterbody ID:** CT5108-00_01**Characteristics:** Freshwater, Class A, Potential Drinking Water Source, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, and Industrial and Agricultural Water Supply**Impairment:** Recreation (*E. coli* bacteria)**Water Quality Criteria for *E. coli*:**

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

Percent Reduction to meet TMDL:Geometric Mean: **79%**Single Sample: **88%****Data:** 2006-2009 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle**Single sample *E. coli* (colonies/100 mL) data from Station 1845 on the East River with annual geometric means calculated**

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1845	Private drive off Goose Lane	6/1/2006	75	wet	369
1845	Private drive off Goose Lane	6/19/2006	75	dry	
1845	Private drive off Goose Lane	6/26/2006	590	dry	
1845	Private drive off Goose Lane	7/5/2006	2900	wet	
1845	Private drive off Goose Lane	7/10/2006	250	dry	
1845	Private drive off Goose Lane	7/17/2006	130	dry	
1845	Private drive off Goose Lane	7/24/2006	170	dry	
1845	Private drive off Goose Lane	7/31/2006	540	dry	
1845	Private drive off Goose Lane	8/7/2006	930	dry	
1845	Private drive off Goose Lane	8/14/2006	160	dry	
1845	Private drive off Goose Lane	8/21/2006	450	wet	
1845	Private drive off Goose Lane	8/28/2006	3300* (88%)	wet	

Single sample *E. coli* (colonies/100 mL) data from Station 1845 on the East River with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1845	Private drive off Goose Lane	5/29/2007	74	dry	401
1845	Private drive off Goose Lane	6/4/2007	2100	wet	
1845	Private drive off Goose Lane	6/11/2007	180	wet	
1845	Private drive off Goose Lane	6/18/2007	180	dry	
1845	Private drive off Goose Lane	6/25/2007	350	dry	
1845	Private drive off Goose Lane	7/2/2007	220	dry	
1845	Private drive off Goose Lane	7/9/2007	440	dry	
1845	Private drive off Goose Lane	7/16/2007	475 [†]	dry	
1845	Private drive off Goose Lane	7/23/2007	570	wet	
1845	Private drive off Goose Lane	7/30/2007	310	dry	
1845	Private drive off Goose Lane	8/6/2007	485 [†]	dry	
1845	Private drive off Goose Lane	8/13/2007	630	dry	
1845	Private drive off Goose Lane	8/20/2007	430 [†]	dry	
1845	Private drive off Goose Lane	8/27/2007	1500	dry	
1845	Private drive off Goose Lane	6/3/2008	320	dry	596* (79%)
1845	Private drive off Goose Lane	6/9/2008	2700	wet	
1845	Private drive off Goose Lane	6/16/2008	370	wet	
1845	Private drive off Goose Lane	6/23/2008	240	wet**	
1845	Private drive off Goose Lane	6/30/2008	1900	dry	
1845	Private drive off Goose Lane	7/7/2008	280	dry	
1845	Private drive off Goose Lane	7/14/2008	2000	wet	
1845	Private drive off Goose Lane	7/21/2008	370	dry	
1845	Private drive off Goose Lane	7/28/2008	330	wet	
1845	Private drive off Goose Lane	8/4/2008	450	dry	
1845	Private drive off Goose Lane	8/11/2008	590	dry	
1845	Private drive off Goose Lane	8/18/2008	830	dry	
1845	Private drive off Goose Lane	8/25/2008	550	dry	

Single sample *E. coli* (colonies/100 mL) data from Station 1845 on the East River with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1845	Private drive off Goose Lane	6/8/2009	150	dry	191
1845	Private drive off Goose Lane	6/15/2009	96	wet	
1845	Private drive off Goose Lane	6/22/2009	530	wet	
1845	Private drive off Goose Lane	6/29/2009	200	dry	
1845	Private drive off Goose Lane	7/7/2009	180	wet	
1845	Private drive off Goose Lane	7/13/2009	98	dry	
1845	Private drive off Goose Lane	7/20/2009	370	dry	
1845	Private drive off Goose Lane	7/27/2009	140	dry	
1845	Private drive off Goose Lane	8/3/2009	130	dry	
1845	Private drive off Goose Lane	8/10/2009	110	dry	
1845	Private drive off Goose Lane	8/17/2009	490	dry	
1845	Private drive off Goose Lane	8/31/2009	240	dry	
Shaded cells indicate an exceedance of water quality criteria					
†Average of two duplicate samples					
** Weather conditions for selected data taken from Hartford because local station had missing data					
*Indicates single sample and geometric mean values used to calculate the percent reduction					

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for Station 1845 on the East River

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
1845	Private drive off Goose Lane (between Sullivan Drive and Nut Plains Road)	2006-2009	15	36	365	541	310
Shaded cells indicate an exceedance of water quality criteria Weather condition determined from rain gages at Tweed KMMK station in New Haven, CT and at Hartford Bradley International Airport							

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